APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/786,823	04/19/2001	Jong Uk Choi	KPLO-7023	6741

321 7590 04/06/2004			EXAMINER	
SENNIGER POWERS LEAVITT AND ROEDEL			AKHAVANNIK, HUSSEIN	
ONE METROPOLITAN SQUARE				
16TH FLOOR			ART UNIT	PAPER NUMBER
ST LOUIS, MO 63102			2621	

DATE MAILED: 04/06/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) FROM
THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed
after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any
earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is
closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *20* is/are allowed.

6)☒ Claim(s) *1-19* is/are rejected.

7)☒ Claim(s) *1,3,4,8,10,12,15,18 and 20* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *19 April 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☒ All   b)☐ Some * c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☒ Copies of the certified copies of the priority documents have been received in this National Stage
application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>5</u>.

4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____ .

DETAILED ACTION

Specification

1.   The disclosure is objected to because of the following informalities:

On page 1, the status of Korean Patent Application Serial Numbers 37273 and 37274 should be updated to indicate any publications of these applications.

On page 5, "Tthis method avoids impairment" should be changed to "This method avoids impairment".

On page 7, "a color image using WT and DCT.." should be changed to "a color image using WT and DCT.".

On page 16, "Detailed Description of the Invention – Color Image Watermarking" should be deleted.

Appropriate correction is required.

2.   A substitute specification excluding the claims is required pursuant to 37 CFR 1.125(a) because the current specification includes many extraneous marks and blemishes which could affect the scanning of the current application.

A substitute specification filed under 37 CFR 1.125(a) must only contain subject matter from the original specification and any previously entered amendment under 37 CFR 1.121. If the substitute specification contains additional subject matter not of record, the substitute specification must be filed under 37 CFR 1.125(b) and (c)

3.   Claims 1, 8, 10, 12, 15, 18, and 20 are objected to because of the following informalities:

Referring to claim 1, line 3, "a" should be inserted between "using" and "discrete".

Referring to claim 8, line 6, "watermark-embeded" should be changed to "watermark-embedded".

Referring to claim 10, line 2, "before it is integrated wavelet transformed image" should be changed to "before the DCT-transformed watermark is integrated with the wavelet transformed image".

Referring to claim 12, line 3, "transforming" should be inserted between "(WT)" and "a color".

Referring to claim 15, line 1, "WC(y))" should be changed to "WC(y)".

Referring to claim 18, line 4, "watermark using wavelet transformation(WT) and discrete" should be changed to "watermark using a wavelet transformation (WT) and a discrete".

Referring to claim 20, line 6, "WC(y))" should be changed to "WC(y)".

Appropriate correction is required.

Allowable Subject Matter

4.   Claim 20 is allowed.

5.   Claims 3-4, 10, and 15 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

6.   The following is a statement of reasons for the indication of allowable subject matter:

The closest cited prior art (PCT Publication WO 99/63443) fails to teach of suggest the feature of a DCT-transformed watermark being further transformed using m-level wavelet transform before being integrated with a wavelet-transformed image as recited in claims 3, 10 and 15. Claim 4 is also objected to for the same reason as above.

Claim Rejections - 35 USC § 102

7.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the

basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed
in the United States before the invention by the applicant for patent or (2) a patent granted on an application for
patent by another filed in the United States before the invention by the applicant for patent, except that an
international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this
subsection of an application filed in the United States only if the international application designated the United
States and was published under Article 21(2) of such treaty in the English language.

8.   Claims 1-2, 7-9, 12, and 18 are rejected under 35 U.S.C. 102(e) as being anticipated by

Ho et al (PCT Publication WO 99/63443).

Referring to claim 1,

i.   Transforming a digital image using a wavelet transform (WT) is explained by Ho

et al on page 2, lines 23-24. The unlabelled data corresponds to the digital image and the

orthogonal transform corresponds to the wavelet transform. Ho et al explain on page 5,

lines 17-20 that a wavelet transform can be used as the orthogonal transform, but Ho et al

also encompass the possibilities of DCT, Fourier, Walsh-Hadamard, Haar, or Sine

transforms. The Applicants explain on pages 10-11 that continuous wavelet transforms

cannot be realized in practice and therefore, the current invention "utilizes the classical 2-

channel sub-band coding" in order to perform the wavelet transform. A 2-channel

wavelet transform determines and separates the high horizontal and vertical frequency

image information from the low horizontal and vertical frequency image information, as

illustrated by the Applicants in figure 2. A common DCT transform also separates the

frequency information of an image according to the magnitude of the vertical and

horizontal frequencies (a feature of the DCT exploited in JPEG compression). Thus, the

2-channel wavelet transform utilized by the current invention corresponds to the DCT, preferably used by Ho et al. Therefore, Ho et al transform the original digital image using a method (DCT) corresponding to the 2-channel wavelet transform used in the current invention <u>and</u> explicitly suggest using the wavelet transform as an alternative to the DCT to perform an orthogonal transformation.

ii.   Transforming a watermark using discrete cosine transform (DCT) is explained by Ho et al on page 2, lines 27-28. Ho et al explain on page 5, lines 17-20 that the orthogonal transform used is a DCT.

iii.   Integrating a DCT-transformed watermark with the wavelet-transformed image to generate a watermark-embedded image is explained by Ho et al on page 2, lines 29-32. The watermark data transform coefficient corresponds to the DCT-transformed watermark (explained in part ii of this claim), the unlabelled data transform coefficient corresponds to the wavelet-transformed image (corresponding to part i of this claim), and the labeled set of data transform coefficient corresponds to the watermark-embedded image.

Referring to claim 2, an inverse wavelet transforming the wavelet-transformed image is explained by Ho et al on page 3, lines 1-3. Ho et al explain that the inverse orthogonal transform is preferably an inverse DCT, but also encompass the possibility of an inverse wavelet on page 5, lines 17-20.

Referring to claim 7, the digital image and the watermark being black and white is explained by Ho et al on page 5, lines 21-23 and page 6, lines 30-32.

Referring to claim 8,

i.   A means for providing a digital image and a watermark is illustrated by Ho et al

in figure 7 by the "Read Data" section of the system that reads unlabelled data (12) and

watermark data (13).

ii.   A digital processing system for transforming the digital image using wavelet

transform (WT) corresponds to claim 1i, wherein the "Forward DCT" (30) is illustrated

by Ho et al in figure 7.

iii.   Transforming the watermark using a digital cosine transform (DCT) corresponds

to claim 1ii, wherein the "Forward DCT" (30) is illustrated by Ho et al in figure 7.

iv.   Integrating the DCT-transformed watermark with the wavelet-transformed image

to generate a watermark-embedded image corresponds to claim 1iii, wherein the "Encode

Watermark Data to Unlabelled Data" (36) is illustrated by Ho et al in figure 7.

Referring to claim 9, the system including means for carrying out digital watermarking a

black and white image using the wavelet transform (WT) and the discrete cosine transform

(DCT), wherein the watermark is black and white is explained by Ho et al on page 5, lines 21-23

and page 6, lines 30-32.

Referring to claim 12,

i.   Discrete cosine transform (DCT) transforming a watermark corresponds to claim

1ii.

ii.   Wavelet transform (WT) transforming a color image corresponds to claim 1i,

wherein Ho et al explain that the unlabelled image may be in color on page 5, lines 21-

23.

iii.   Integrating a DCT-transformed watermark with the wavelet-transformed color

image corresponds to claim 1iii.

Referring to claim 18,

i.   A means for providing a color image and a black and white watermark is

illustrated by Ho et al in figure 7 by the "Read Data" " section of the system that reads

unlabelled data (12) and watermark data (13). Ho et al explain that the unlabelled data

may be color on page 5, line 21-23 and that the watermark may be black and white on

page 6, lines 30-32.

ii.   A digital data processing means for digital watermarking the color image with the

black and white watermark using wavelet transformation (WT) and discrete cosine

transform (DCT) corresponds to claim 1i-iii.

Claim Rejections - 35 USC § 103

9.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in
> section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are
> such that the subject matter as a whole would have been obvious at the time the invention was made to a person
> having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the
> manner in which the invention was made.

10.   Claims 5, 11, and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ho

et al in view of Xia et al (U.S. Patent No. 6,556,689).

Referring to claims 5 and 16, the wavelet transform being performed using a filter bank

realizing high-speed wavelet-transform is not explicitly explained by Ho et al. However, Xia et

al illustrate using a filter bank to perform high-speed wavelet-transforms in figure 2. Xia et al

explain in column 2, lines 41-44 that the filter banks illustrated perform the DWT and IDWT of a

2-dimensional signal (corresponding to an image). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a filter bank realizing high-speed wavelet-transform in order to perform the wavelet transform suggested in the system of Ho et al because such filter banks are well-known in the art to efficiently and quickly perform wavelet transforms.

Referring to claim 11, the system including filter banks for providing high-speed wavelet-transform and for providing inverse wavelet transform corresponds to claims 2 and 5.

11.   Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ho et al in view of Senoh (U.S. Patent No. 6,240,121).

Referring to claim 6, a scaling parameter, alpha, being used to adjust the spacing between the original image and the watermark is not explicitly explained by Ho et al. However, Senoh illustrates a weighting/addition section to weight watermark coefficients (corresponding to the pseudo random numbers) and adds them to an input image in figure 1 by reference number 23. Senoh explains in column 7, lines 27-61 that the weighting Factor K_{ij} (corresponding to the parameter, alpha) are set as a function of the frequency band of the original image coefficients. By weighting the watermark coefficients, the watermark is "hardly detectable" in the middle frequency bands, where humans have the highest sensitivity. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to scale the watermark coefficients as taught by Senoh before embedding them into the unlabelled image of Ho et al because the imperceptibility of the watermark is increased.

12.   Claims 13-14 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ho et al in view of Benamara (U.S. Patent No. 6,128,413).

Referring to claim 13, converting the color image in the RGB mode, RGB(x), into Y(x), I(x), and Q(x) in the YIQ mode using a conversion matrix is not explicitly explained by Ho et al. However, Benamara illustrates converting RGB color image information into YIQ color image information in figure 5A by reference number 516. Benamara explain that RGB color information is not independent, whereas YIQ color information is in column 10, lines 22-28. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to convert the color image in the RGB mode to the YIQ mode as explained by Benamara in the system of Ho et al because the colors will be treated independently.

Referring to claim 14,

i.   Transforming Y(x) of the converted image using wavelet transform is not explicitly explained by Ho et al. However, Benamara illustrate Y(x) image data being converted using a wavelet transform (520) in figure 5A by reference number 522 (Y^T). Benamara explains that Y data is concentrated on the most in column 10, lines 22-28.

ii.   Transforming a watermark, W(y), using discrete cosine transform (DCT) corresponds to claim 12i.

iii.   Integrating the DCT-transformed watermark, WC(y), with the wavelet-transformed color image, DW(x), corresponds to claim 12iii.

iv.   Generating Y-values of the integrated image, Y(x)', using inverse wavelet transform is not explicitly explained by Ho et al. However, Benamara illustrate Y-values (Y') being output from an inverse wavelet transformer (544) in figure 5B by reference number 546.

v.   Generating a watermark-embedded image in the RGB mode, RGB(x)', by inverse transformation of Y(x)', I(x)', and Q(x)' is not explicitly explained by Ho et al. However, Benamara illustrate RGB data being output from an inverse transformation of YIQ (548) in figure 7 by reference number 550. Benamara explain that RGB color information is not independent, whereas YIQ color information is in column 10, lines 22-28. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to convert the color image in the RGB mode to the YIQ mode as explained by Benamara in the system of Ho et al because the colors will be treated independently.

Referring to claim 19,

i.   A means for converting the color image in the RGB mode, RGB(x), into Y(x), I(x), and Q(x) in the YIQ mode using a conversion matrix corresponds to claim 13.

ii.   A means for transforming Y(x) of the converted image using wavelet transform corresponds to claim 14i.

iii.   A means for transforming a watermark in black and white, W(y), using discrete cosine transform (DCT) corresponds to claim 7.

iv.   A means for integrating the DCT-transformed watermark, WC(y), with the wavelet-transformed color image, DW(x), corresponds to claim 14iii.

v.   A means for generating Y-values of the integrated image, Y(x)', using inverse wavelet transform corresponds to claim 14iv.

vi.   A means for generating a watermark-embedded image in the RGB mode, RGB(x)', by inverse transformation of Y(x)', I(x)', and Q(x)' corresponds to claim 14v.

Conclusion

13.   The prior art made of record and not relied upon is considered pertinent to applicant's

disclosure:

   Choi et al (WO 00/59148) – To exhibit embedding a DCT watermark in wavelet

transformed data as illustrated in figure 1.

   Hayashi et al (U.S. Patent No. 6,434,253) – To exhibit DCT or wavelet based

watermarking of an input image as illustrated in figures 1 and 2.

   Nakano (U.S. Patent No. 6,510,233) – To exhibit scaling of a watermark in the

frequency domain as explained in column 9, lines 10-14.

   Tewfik et al (U.S. Patent No. 6,226,387) – To exhibit performing a DCT of

wavelet transformed image data as illustrated in figure 4.

14.   Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Hussein Akhavannik whose telephone number is (703)306-4049.

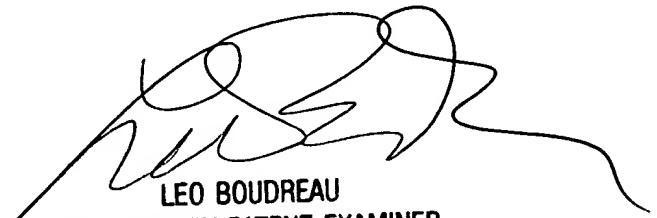The examiner can normally be reached on M-F 8:30-5:00.

   If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Leo H. Boudreau can be reached on (703)305-4706. The fax phone number for the

organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent

Application Information Retrieval (PAIR) system. Status information for published applications

may be obtained from either Private PAIR or Public PAIR. Status information for unpublished

applications is available through Private PAIR only. For more information about the PAIR

system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR

system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Hussein Akhavannik H A
March 31, 2004

LEO BOUDREAU
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